Fig. 1 PRIOR ART

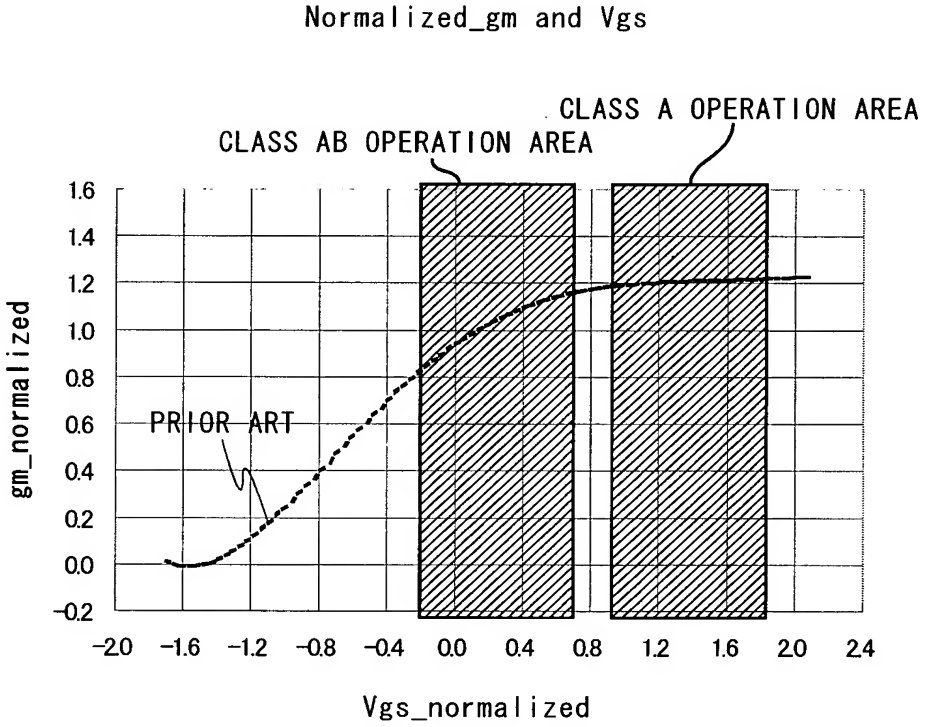


Fig. 2

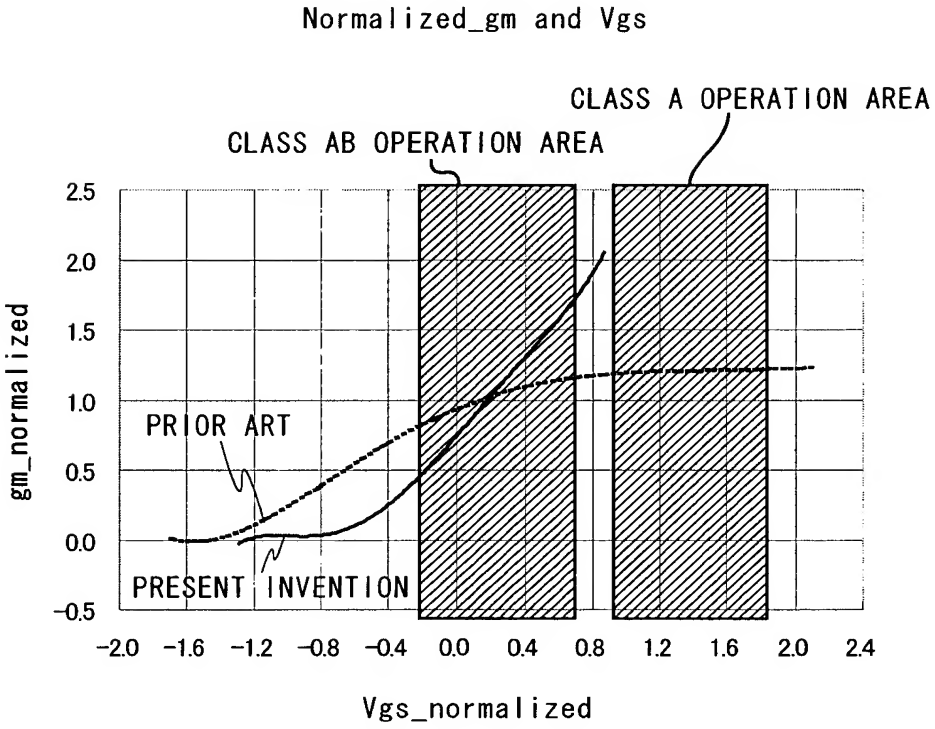

Normalized_gm and Vgs
CLASS A OPERATION AREA
CLASS AB OPERATION AREA
gm_normalized
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
PRIOR ART
PRESENT INVENTION
-2.0
-1.6
-1.2
-0.8
-0.4
0.0
0.4
0.8
1.2
1.6
2.0
2.4
Vgs_normalized

Fig. 3

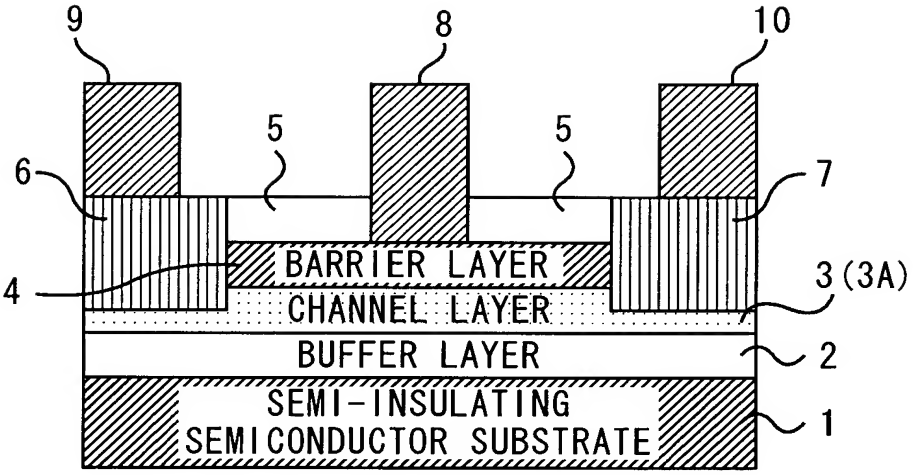

9
8
10
5
5
6
7
BARRIER LAYER
4
3(3A)
CHANNEL LAYER
BUFFER LAYER
2
SEMI-INSULATING
SEMICONDUCTOR SUBSTRATE
1

Fig. 4

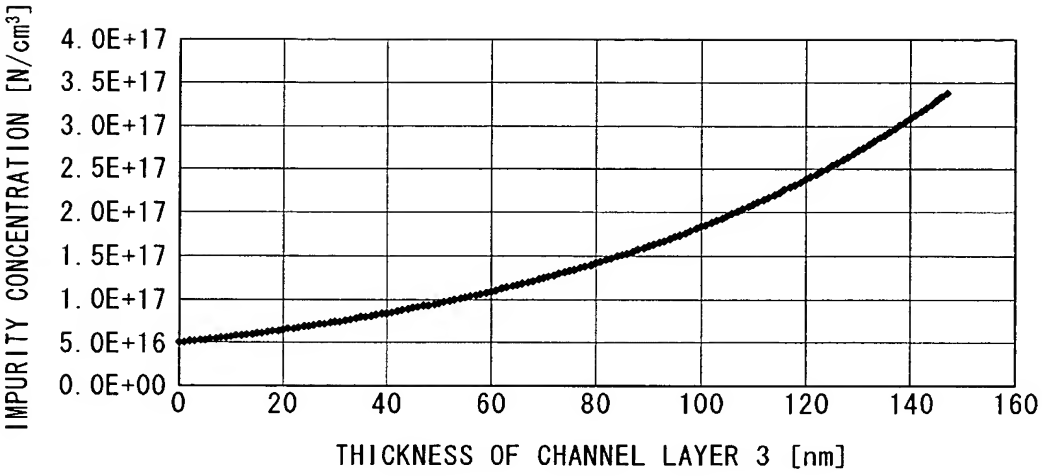

IMPURITY CONCENTRATION [N/cm3]
4.0E+17
3.5E+17
3.0E+17
2.5E+17
2.0E+17
1.5E+17
1.0E+17
5.0E+16
0.0E+00
0
20
40
60
80
100
120
140
160
THICKNESS OF CHANNEL LAYER 3 [nm]

Fig. 5A

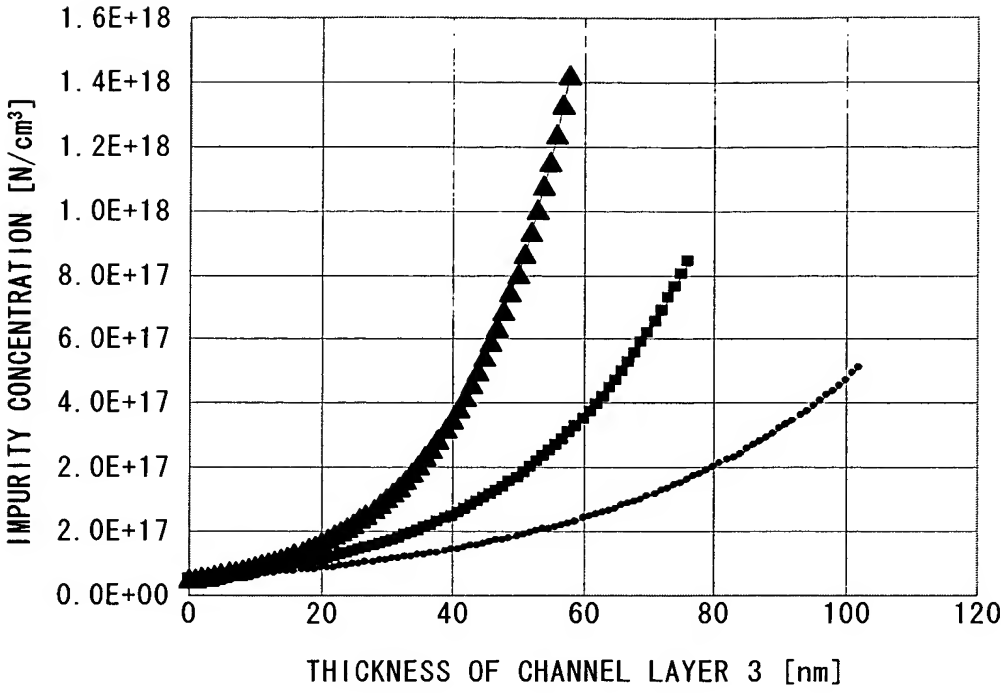

1.6E+18
1.4E+18
1.2E+18
1.0E+18
8.0E+17
6.0E+17
4.0E+17
2.0E+17
2.0E+17
0.0E+00
IMPURITY CONCENTRATION [N/cm³]
0
20
40
60
80
100
120
THICKNESS OF CHANNEL LAYER 3 [nm]

Fig. 5B

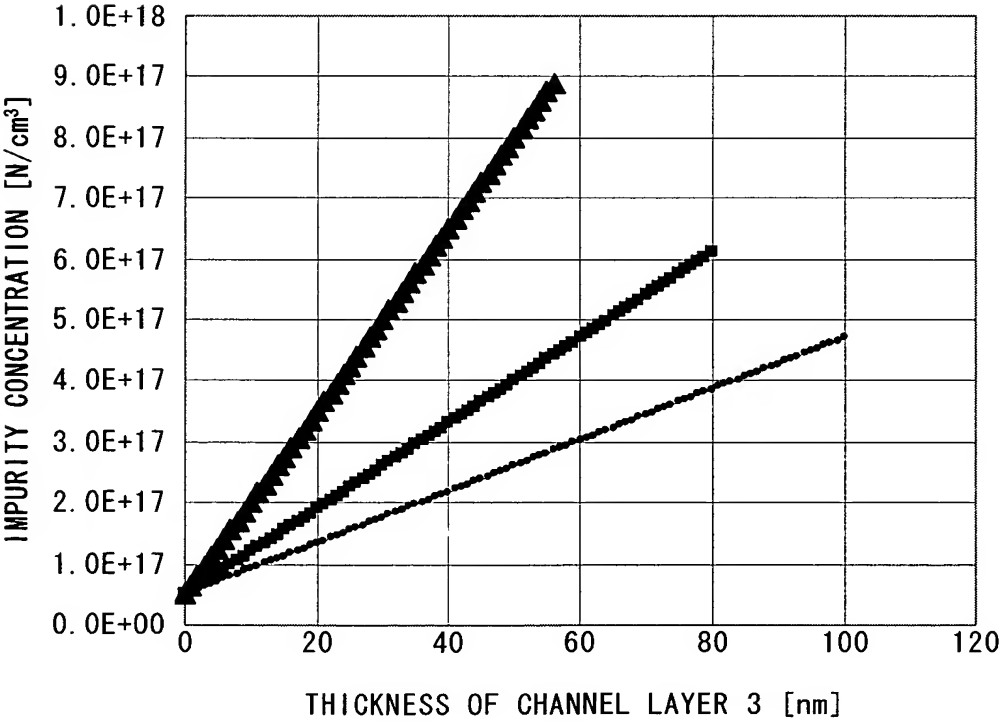

1.0E+18
9.0E+17
8.0E+17
7.0E+17
6.0E+17
5.0E+17
4.0E+17
3.0E+17
2.0E+17
1.0E+17
0.0E+00
IMPURITY CONCENTRATION [N/cm³]
0
20
40
60
80
100
120
THICKNESS OF CHANNEL LAYER 3 [nm]

Fig. 6A

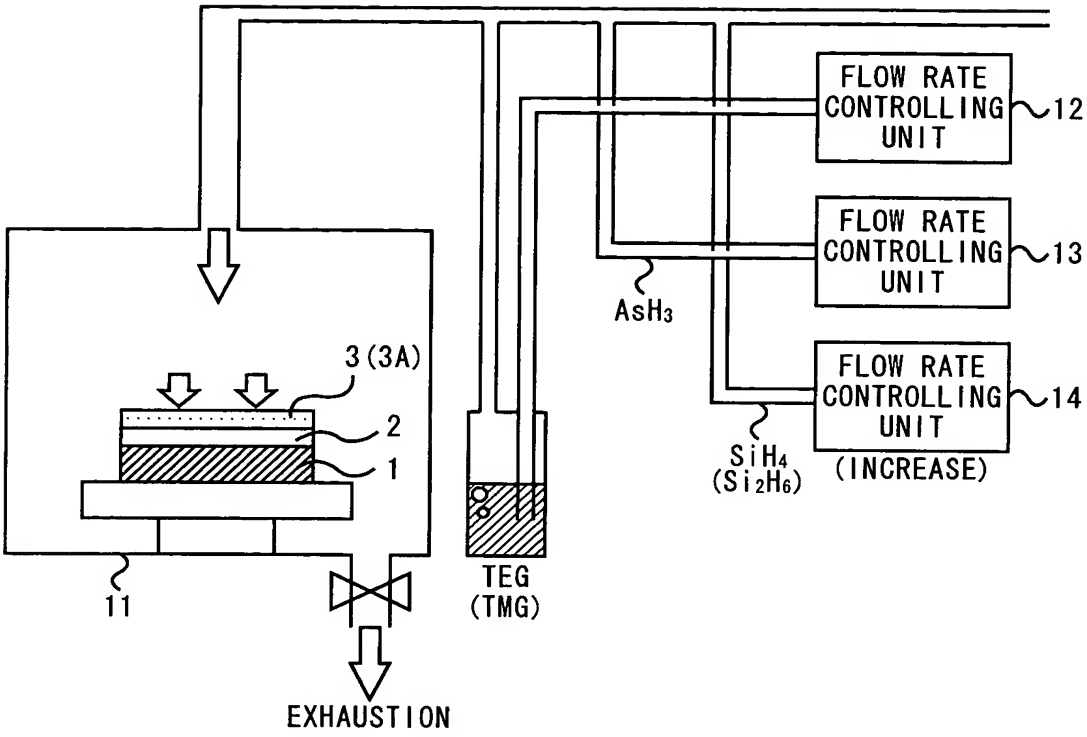

FLOW RATE CONTROLLING UNIT
12
FLOW RATE CONTROLLING UNIT
13
FLOW RATE CONTROLLING UNIT
14
(INCREASE)
AsH3
SiH4 (Si2H6)
3(3A)
2
1
11
TEG (TMG)
EXHAUSTION

Fig. 6B

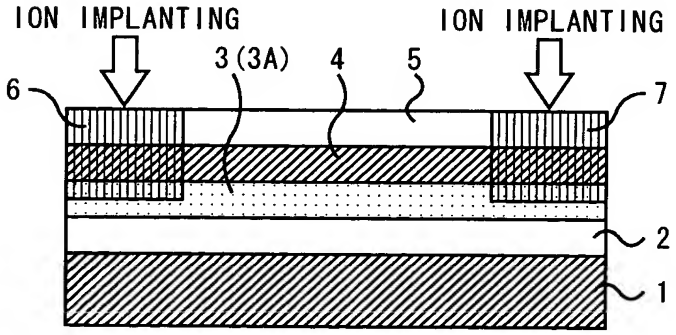

ION IMPLANTING
ION IMPLANTING
3(3A)
4
5
6
7
2
1

Fig. 7

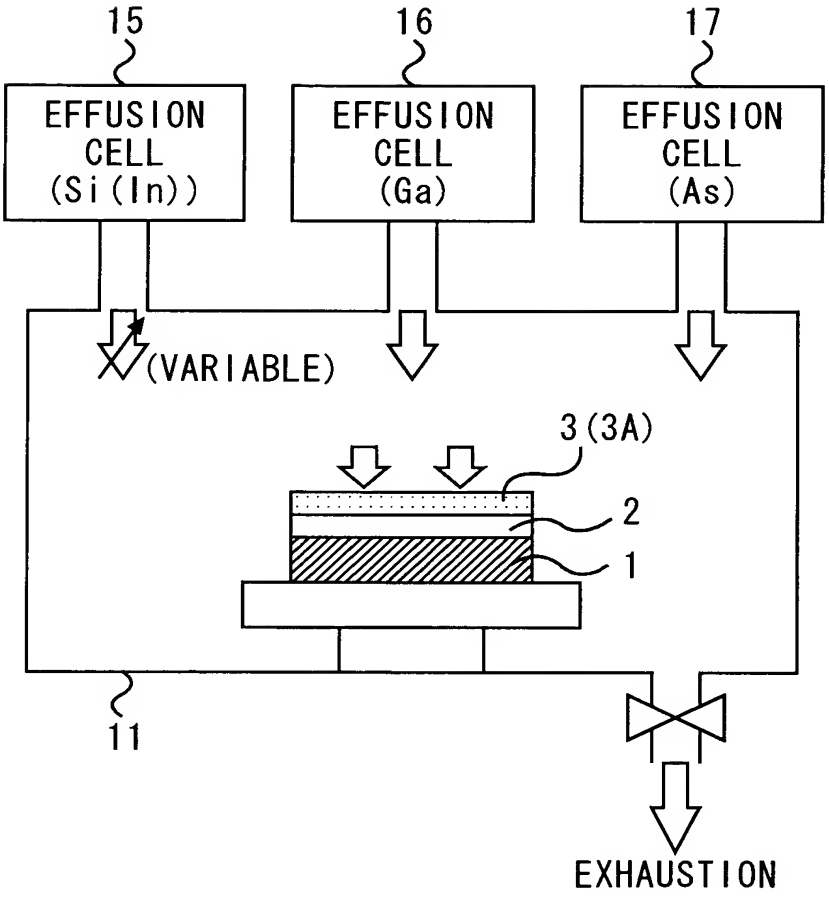
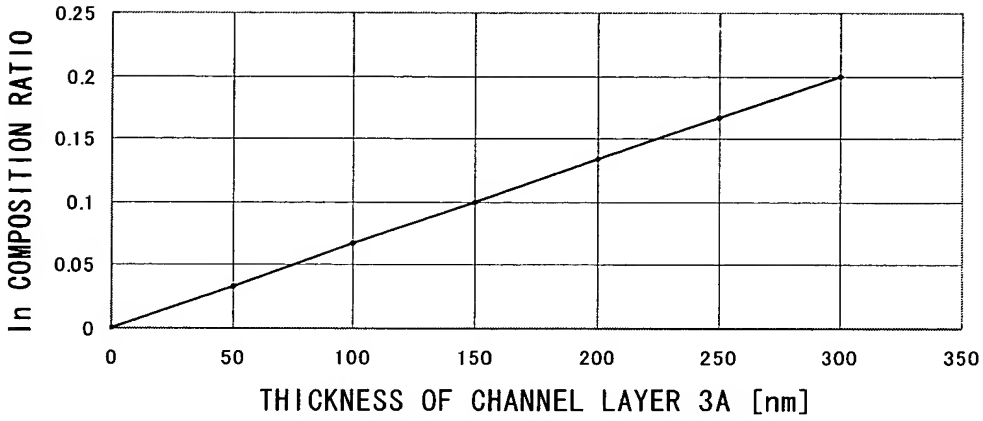

15
16
17
EFFUSION CELL (Si(In))
EFFUSION CELL (Ga)
EFFUSION CELL (As)
(VARIABLE)
3(3A)
2
1
11
EXHAUSTION

Fig. 8


In COMPOSITION RATIO
0.25
0.2
0.15
0.1
0.05
0
0
50
100
150
200
250
300
350
THICKNESS OF CHANNEL LAYER 3A [nm]